

Integration of full-spectrum metrology and polishing for rapid production of large aspheres, Phase I

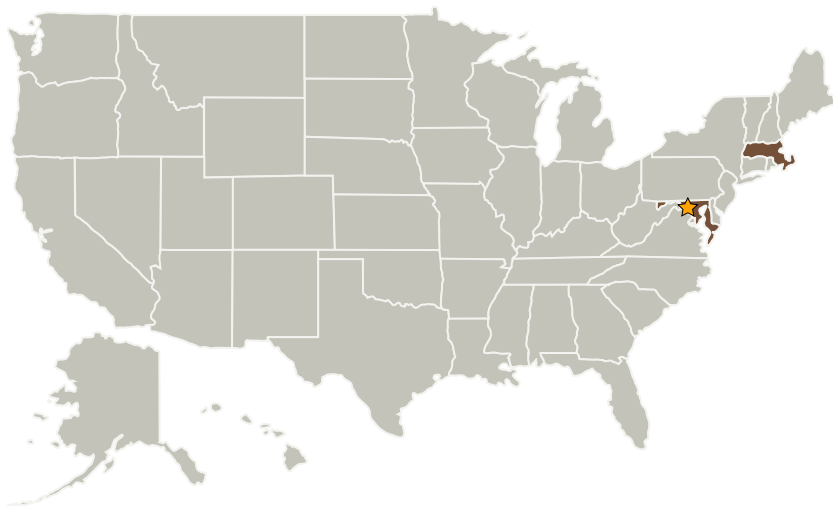
Completed Technology Project (2004 - 2004)



Project Introduction

Integration of three proven, non-contact, optical metrology techniques with an emerging new polishing approach in a single machine will enable the rapid production of large aspheric mirrors with nanometer-class overall accuracy, excellent smoothness, and nearly arbitrary radius of curvature (concave or convex) and aspheric form. Two of the metrology approaches are a multi-point profilometer that we have previously demonstrated to have nanometer-level accuracy for low spatial frequencies; and a curvature-measuring profilometer that we have previously demonstrated to have 0.1-nanometer-level accuracy for mid-spatial frequencies. In addition, we propose the simple addition of a scatterometry-based measurement head for high spatial frequencies. The baseline polishing approach is fluid jet polishing, which has been shown to be capable of both fine grinding and polishing. A new understanding of the synergism of these metrology techniques with ductile polishing promises to take in situ metrology and optical fabrication to a major new level. NASA is continually pushing the frontier in astronomical and earth-observing optical systems. Many of these systems, whether they operate in the x-ray (at normal incidence), ultraviolet, visible, or infrared, have the meter-class (and beyond) optics that would greatly benefit from this technology.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Bauer Associates, Inc.	Supporting Organization	Industry	Natick, Massachusetts

Primary U.S. Work Locations

Maryland	Massachusetts
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul E Glenn

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes